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D. Remarks

Issue 1: Whether Claims 1 and 2 are Patentable Under 35 U.S.C. §102(a) over Applicant's Background Art (*Background Art*).

5 The invention of amended claim 1 is directed to a semiconductor device structure having an insulating film formed from gas containing carbon. The semiconductor device includes a contact, a gate electrode, and a silicon nitride film. The contact penetrates an interlayer insulating film and is electrically connected with a diffusion layer in a silicon substrate. The gate electrode is formed on the silicon substrate and contains a nitride film at upper and side portions.

10 The invention also further includes a silicon nitride film for preventing carbon diffusion. This silicon nitride has a portion sandwiched between the interlayer insulating film and the silicon substrate while traversing a region except a portion for providing the electrical connection between the contact and the diffusion layer. Further, this silicon nitride film is formed on the nitride film at the upper and side portion of the gate electrode.

15 As is well known, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference. More particularly:

Invalidity for anticipation requires that all of the elements and limitations of the claim are found within a single prior art reference... There must be no difference
20 between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill...¹

As emphasized above, Applicant's claim 1 invention clearly recites two separate limitations:

- 25 (1) a nitride film at upper and side portions of a gate electrode, and
(2) a silicon nitride film formed on the nitride film at upper and side portions of the gate electrode.

It is Applicant's contention that the *Background Art* does not show the above limitations.

The *Background Art* shows a gate electrode containing a nitride film and upper and side

¹ Scripps Clinic & Research Found. v. Genentech Inc., 18 USPQ 2d 1001, 1010 (Fed. Cir. 1991), emphasis added.

portions.² There is no other nitride film. Thus, the *Background Art* does not show a “silicon nitride layer formed on the nitride film at upper and side portions” as recited in claim 1.

To address Applicant’s previous arguments, rejection relies on the following reasoning:

5 [Applicant’s argument] is not persuasive as... silicon nitride films 20 and 24 are considered two separate films laminated on one another. The inner portion of 24 (contacting the gate electrode) and the lower portion of 20 (contacting insulator 26) are considered the first nitride film formed at upper and side portions of the gate electrode. The outer portion of 24 (contacting insulator 26) and the upper
10 portion of 20 (contacting insulator 26) are considered the silicon nitride film for preventing carbon diffusion.³

Thus, the rejection “considers” film 20 as two separate films, and considers film 24 as two separate films. Such an interpretation is erroneous. As is clear by viewing Applicant’s FIG. 18,
15 film 20 is drawn as a single film, and film 24 is drawn as single film. Further, such films are clearly described in the *Background Art* as single films:

Thereafter a wiring is formed with... silicon nitride film 20...⁴

20 Next, a silicon nitride film is formed... and etched back to form silicon nitride film sidewall 24...⁵

It is noted that both excerpts describe films 20 and 24 in the singular and thus each do not show plural films, as argued by the rejection.

25 The rejection appears to either modify the teachings of the *Background Art*, or argue that separate films within both film 20 and 24 are inherently shown:

² See the Specification, FIG. 16(a), which shows a gate electrode **22** that includes silicon nitride film **20** on the top of a gate electrode **18/16**, and silicon nitride film **24** on the side of the gate electrode **18/16**.

³ Final Office Action, dated 8/19/03, Page 5, Last paragraph.

⁴ Applicant’s Specification, Page 3, Lines 18-19.

⁵ Applicant’s Specification, Page 3, Lines 20-21.

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There is no structural difference between the single layers 20 and 24 being considered two layers and two layers formed one on the other. Since silicon nitride films are amorphous films, there is no structural difference between a single layer and two layers of the same material stacked on top of the other. The amorphous films will result in no difference in structure at the interface between the layers as long as the layers are made of the same material.⁶

Applicants object to the above reasoning. First, this reasoning is not from the cited reference, either explicitly or inherently. Second, if such reasoning is argued to be “well known”, reliance in such reasoning is not proper for a rejection based on 35 U.S.C. §102, but rather should be based on 35 U.S.C. §103. Further, as requested in the previous Response to Final Office Action⁷, Applicant seasonably traverses this assertion and requests a reference in support. Third, this reasoning is incorrect.

As noted above, the rejection relies on the following reasoning:

Since silicon nitride films are amorphous films, there is no structural difference between a single layer and two layers of the same material...

This is false. In addition, to amorphous forms, silicon nitride can assume hexagonal crystal forms, often referred to as α -Si₃N₄ and β -Si₃N₄. As evidence in support of this fact Applicant submits herewith, in Exhibits A and B, two articles establishing that silicon nitride can assume a crystalline (e.g., non-amorphous) form. Numerous other articles may be cited in support of this well known principle.

The above presents conclusive evidence that that factual basis upon which claim 1 has been rejected is incorrect.

Second, Applicant’s amended claim 1 recites that the silicon nitride film has a portion sandwiched between the interlayer insulating film and the substrate. Such a limitation is not shown in the *Background Art*. Even if the separate single nitride layers of the *Background Art* are construed as separate layers, such layers are not sandwiched between the interlayer insulating

⁶ Final Office Action, dated 8/19/03, Page 5, Last two lines to Page 6, Line 7.

⁷ See Applicant’s Response to Final Office Action, dated 7/21/03, Page 6, Line 10.

film and the substrate. As shown in FIG. 18 of the *Background Art*, layer 24 (a portion of which is argued to correspond to Applicant's silicon nitride film), is sandwiched between a gate structure and interlayer insulating film 26, not between the substrate 12 and interlayer insulating film 26. Thus, the *Background Art* does not show all limitations of amended claim 1.

5 For all of these reasons, this ground for rejection is traversed.

Issue 2: Whether Claims 21 to 24 are Patentable Under 35 U.S.C. §102(a) over Applicant's Background Art (*Background Art*).

10 Applicant previously submitted a lengthy analysis indicating that the rejection of claim 21, first, does not show all limitations of claim 21 and second, is based on inconsistent application of *Background Art* items to claim terms. Applicant's arguments remain unrebutted, and so will be resubmitted here.

The invention of amended claim 21 is directed to a semiconductor device structure that includes an insulating film formed from a gas containing carbon. The semiconductor device
15 includes a contact, a capacitor contact that penetrates second and third interlayer insulating films, and a conductor formed on the second interlayer insulating film. The conductor contains a nitride film at upper and side portions. In addition, the semiconductor device includes a silicon nitride film for preventing carbon diffusion. The silicon nitride film is formed on the third interlayer insulating film while traversing a region except a connection portion between a lower
20 electrode and the capacitor contact. The silicon nitride film is also formed above the nitride film at the upper portion of the conductor.

Thus, Applicant's claim 21 invention clearly recites two separate limitations:

(1) a nitride film at upper and side portions of a conductor, and

(2) a silicon nitride film formed above the nitride film at upper and side portions of the
25 conductor.

The above two, clearly separate limitations are not shown in the *Background Art*.

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The *Background Art* shows a bit line containing a nitride film and upper and side portions.⁸ There is no other nitride film. Thus, the *Background Art* does not show a “silicon nitride layer formed above the nitride film at upper and side portions” as recited in claim 21.

To show such a limitation, the rejection modifies single layer structures of the
5 *Background Art*.

Films 36 and 40 are each considered two separate nitride layers laminated on one another where the first layer (the lower portion of 36 and the inside portion 40) are the nitride film on the conductor while the second layer (upper portion of 36
10 and the outside portion of 40) are the silicon nitride film for preventing carbon diffusion.⁹

First, as in the case of claim 1, this teaching is not from the reference, and contradicts the reference. Applicant’s *Background Art* makes it clear that films 20 and 24 are single layers. The
15 attempt by the rejection, to add a layer where one clearly does not, exist is refuted by the explicit teachings of Applicant’s *Background Art*, which explicitly indicates single layers:

a silicon nitride film 36, and a silicon nitride film side wall 40...¹⁰

20 In addition, Applicant incorporates by reference herein the comments set forth above for claim 1 which establish that “considering” a single film to be the same as two laminated films is based on incorrect facts.

Rejection is Not Consistent With Claim Terms

25 The rejection applies *Background Art* structures inconsistently to Applicant’s claims terms. Nevertheless, under the various possible combinations, all claim terms are not shown. The inconsistencies are emphasized below:

⁸ See the Specification, FIG. 17, which shows a bit line 38 that includes silicon nitride film 36 on the top of a bit line conductors 34/33, and silicon nitride film 40 on the side of bit line conductors 34/33.

⁹ Final Office Action, dated 5/23/03, Page 3, Lines 2-5.

¹⁰ Applicant’s Specification, Page 3, Lines 2 (emphasis added).

[A] second interlayer insulating film 26 and a third interlayer insulating film 26...¹¹

5 [O]n the third interlayer insulating film 32...¹²

Film 26 is considered a second interlayer insulator (bottom portion) and a third insulator (top portion) of the same material formed one on top of the other.¹³

10 [S]econd layer interlayer insulating film 32 and a third interlayer insulating film 42...¹⁴

That is, in rejecting claims 21-24, the rejection argues that Applicant's second insulating layer is first shown by layer 26 of the *Background Art*, then shown only by a bottom portion of layer 26, then shown by layer 32.

Similarly, the rejection argues that Applicant's third insulating layer is first shown by layer 26 of the *Background Art*, then shown by layer 32, then by only a top portion of layer 26, and then by layer 42.

Applicant will now show that under all such various rejection arguments, the limitations of Applicant's claim 21 invention are not shown.

1. Second Insulating Layer as Layer 26 of the *Background Art*.

If layer 26 of the *Background Art* is argued to correspond to Applicant's "second insulating layer", then *Background Art* cannot show a "capacitor contact". Applicant's claim 21 recites a capacitor contact penetrating the second interlayer insulating film. As shown in FIG. 17 of the Specification, capacitor contact 46 does not penetrate layer 26.

2. Second Insulating Layer as Only Bottom Layer 26 of the *Background Art*.

¹¹ Final Office Action, dated 5/23/03, Page 3, Line 14.

¹² Final Office Action, dated 5/23/03, Page 3, Line 17.

¹³ Final Office Action, dated 5/23/03, Page 3, Lines 20-22.

¹⁴ Final Office Action, dated 5/23/03, Page 4, Lines 13-14.

Like the above case, if the bottom portion of layer 26 is argued to correspond to Applicant's "second insulating layer", then *Background Art* cannot show a "capacitor contact". As shown in FIG. 17 of the Specification, capacitor contact 46 does not penetrate layer 26.

3. Second Insulating Layer as Layer 32 and Third Insulating Layer as Layer 42 of the *Background Art*.

If layer 32 of the *Background Art* is argued to correspond to Applicant's "second insulating layer" and layer 42 is argued to correspond to Applicant's "third insulating layer", then *Background Art* cannot show a "silicon nitride film". Applicant's claim 21 recites a silicon nitride film formed on the third interlayer insulating film. As shown in FIG. 17 of the Specification, layers 36 or 40 (argued to correspond to Applicant's silicon nitride film) are not formed on layer 42.

From the above it is clear that the *Background Art* does not show all limitations of claim 21.

In addition, Applicant's amended claim 21 further recites a fourth interlayer insulating film which is formed on the third interlayer insulating film. Further, the silicon nitride film for preventing carbon diffusion has a portion sandwiched between the fourth interlayer insulating film and the third insulating film.

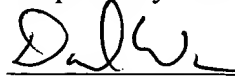
As in the case of claim 1, even if separate single nitride layers of the *Background Art* are construed as separate layers, such layers are not sandwiched between a third and fourth interlayer insulating film, as recited in claim 21. As shown in FIG. 17 of the *Background Art*, layer 40 (a portion of which is argued to correspond to Applicant's silicon nitride film), is sandwiched between a conductive structure and interlayer insulating film 42, not between interlayer insulating films 32 and 42. Thus, the *Background Art* does not show all limitations of amended claim 21.

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Claims 1 and 21 have been amended. Claims 1-2 and 21-24 are believed to be in allowable over the cited art. It is respectfully requested that the application be forwarded for allowance and issue.

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Respectfully Submitted,



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